CLAIMS

1.   A two-dimensional photonic crystal multiplexer/demultiplexer, which is characterized by:

5   a)   a slab-shaped body;

b)   a plurality of areas arranged in a lattice pattern with a predetermined cycle within the body, where a refractive index of the aforementioned areas differs from that of the body;

c)   a first optical input/output section consisting of a waveguide formed in the

10   body, where the waveguide is made of a linear defect of the modified refractive index areas;

d)   a second optical input/output section formed in the body; and

e)   two or more point-like defect resonators composed of point-like defects having substantially the same resonance wavelength and arranged in series between the first and second optical input/output sections, each point-like defect consisting of a point-like

15   region devoid of the modified refractive index areas.

2.   The two-dimensional photonic crystal multiplexer/demultiplexer according to claim 1, which is characterized in that the second optical input/output section is a point-like defect whose Q-value with respect to an outside of the crystal is smaller than that of the

20   point-like defect resonators.

3.   The two-dimensional photonic crystal multiplexer/demultiplexer according to claim 2, which is characterized in that at least one of the point-like resonators is a donor type defect formed by eliminating one or more of the modified refractive index areas.

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4.   The two-dimensional photonic crystal multiplexer/demultiplexer according to claim 1, which is characterized in that the second optical input/output section is a waveguide consisting of a linear defect of the modified refractive index areas.

5   5.   The two-dimensional photonic crystal multiplexer/demultiplexer according to claim 4, which is characterized in that the second optical input/output section is provided with a second reflecting section for reflecting light whose wavelength equals to the aforementioned resonance wavelength.

10   6.   The two-dimensional photonic crystal multiplexer/demultiplexer according to one of claims 1 to 5, which is characterized in that the first optical input/output section is provided with a first reflecting section for reflecting light whose wavelength equals to the aforementioned resonance wavelength.

15   7.   The two-dimensional photonic crystal multiplexer/demultiplexer according to claim 5 or 6, which is characterized in that:

the body is composed of plural forbidden band zones, with modified refractive index areas being formed within each forbidden band zones with a different arrangement cycle;

the first optical input/output section or the second optical input/output section is

20   formed so that it passes through all the forbidden band zones; and

the resonance wavelength of the point-like defect resonators falls within a transmission wavelength band of the waveguide of the first or second optical input/output section in a forbidden band zone including the point-like defect resonators, whereas it is out of the transmission wavelength band of the waveguide in any other forbidden band zone.

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8. The two-dimensional photonic crystal multiplexer/demultiplexer according to one of claims 1 to 7, which is characterized in that:

there are two point-like defect resonators; and

the two point-like defect resonators and the two optical input/output sections are symmetrically arranged with respect to a point.

9. The two-dimensional photonic crystal multiplexer/demultiplexer according to one of claims 1 to 8, which is characterized in that one or more of the modified refractive index areas located in a proximity of the point-like defect resonators are shifted from positions determined by the aforementioned arrangement cycle.

10. The two-dimensional photonic crystal multiplexer/demultiplexer according to one of claims 1 to 9, which is characterized in that a coupling ratio defined as $\mu^2/[(\omega_0/2)\times(1/Q_{in}+1/Q_v)]^2$ is 0.2~10, where ω_0 is a resonance frequency of the point-like defect resonators, Q_{in} is a Q-value between the point-like defect resonators and each of the first and second optical input/output section, Qv is a Q-value between each of the point-like defect resonators and an outside of the crystal, and μ is a mutual coupling coefficient between two point-like defect resonators.